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Review of the genus *Tersilochus* Holmgren (Hymenoptera, Ichneumonidae, Tersilochinae) from South Korea

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Abstract

Ten species of the genus *Tersilochus* are found to occur in South Korea. Eight species belonging to the subgenus *Tersilochus* are described as new: *T. fidicinus* **sp. n.**, *T. gangwonus* **sp. n.**, *T. iracundus* **sp. n.**, *T. nigellus* **sp. n.**, *T. obstinatus* **sp. n.**, *T. punctator* **sp. n.**, *T. serratus* **sp. n.**, and *T. uncinatus* **sp. n.** One abundant and widely distributed Palaearctic species, *T.* (*Gonolochus*) *caudatus* Holmgren, is recorded from South Korea for the first time. A key to 10 South Korean species of the genus *Tersilochus* is provided. Recently discovered finger-shaped flagellar structures are found and described in all Korean species of *Tersilochus*.

Keywords

Tersilochus, Tersilochinae, Palaearctic region, South Korea, taxonomy, key

Introduction

Extensive study of South Korean Tersilochinae was initiated 2 years ago by A. Khalaim and co-authors based on materials from Yeungnam University (Gyeongsan, South Korea). Six Tersilochinae genera were recognized in the Korean fauna, and four of them, *Barycnemis* Förster (two species), *Diaparsis* Förster (11 species, including one new species and two unidentified species), *Gelanes* Horstmann (eight species, including four new species), and *Phradis* Förster (two species), have been reviewed in three papers (Balueva et al. 2013a, 2013b; Kim et al. 2013). The genus *Probles* Förster was also partly revised; three new species of this genus are described (Khalaim et al. 2013) and one abundant species will be described in our forthcoming paper (Balueva et al., unpublished).

In this paper, we review one of the largest tersilochine genera, *Tersilochus* Holmgren. This predominantly Holarctic genus comprises three subgenera with about 65 species: *Gonolochus* Förster (six species), *Pectinolochus* Aubert (19 species), and *Tersilochus* s. str. (40 species). Most species of the genus *Tersilochus* occur in Europe (Horstmann 1971, 1981), and only a few species are known from Nearctic (Horstmann 2001), Afrotropical (Khalaim 2013), and probably Oriental (Khalaim 2011) regions. In the East Palaearctic region, eight species of subgenus *Pectinolochus* were recorded from Mongolia, Russian Siberia, and the Far East (Khalaim 2007), three species were recorded from the Palaearctic part of China (Khalaim and Sheng 2009), one species was described from South Korea (Khalaim 2011), and nine species (including seven new species) were recorded from the Russian Far East and Japan (Khalaim 2012). The most abundant species of the genus, *T.* (*G.*) *caudatus* Holmgren, is widely distributed within the Palaearctic region (Khalaim 2007) but has not been recorded from South Korea till now.

Only one species of the genus *Tersilochus*, *T.* (*T.*) *granulatus* Khalaim, was known from South Korea hitherto. The aim of this work is to describe eight new species and provide a key for identification of ten Korean species of the genus *Tersilochus*.

Materials and methods

The ichneumonid collection of Yeungnam University, Gyeongsan, South Korea (further YUG), was studied. From this material, nine species of the genus *Tersilochus* were recognized (eight of them are new to science), and one recently described species, *T. granulatus*, deposited in the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (further ZISP), was re-examined and photographed. All new species are described from females. Unfortunately, we were unable to identify six males.

Most specimens, including all holotypes, are kept at Yeungnam University, and some specimens are deposited in ZISP.

Photographs were taken at ZISP using a DFC290 digital camera attached to a Leica MZ16 stereomicroscope. Partially focused photographs were combined using Helicon Focus software. In the *Material examined* section, we provide abbreviations

for Korean provinces in addition to the complete names, as abbreviations are widely used in our previous papers on Korean Tersilochinae. Morphological terminology predominantly follows Townes (1969, 1971) with changes according to Khalaim (2011). Additional characters in the key are given in square brackets.

Taxonomy

Tersilochus Holmgren, 1859

http://species-id.net/wiki/Tersilochus

Type species. *Thersilochus cognatus* Holmgren, 1860 (= *jocator* Holmgren, 1859) (Horstmann 2005: 1269–1270).

All Korean species have occipital carina complete, scutellum with lateral longitudinal carinae developed only at its basal part, fore wing with second recurrent vein distinctly postfurcal and legs slender with tarsal claws not pectinate.

Key to species of *Tersilochus* occurring in South Korea

1 Second tergite 2.0–2.5 times as long as anteriorly broad. Thyridial depression distinctly elongate. First tergite very slender, about 5.0 times as long as posteriorly broad, smooth, with small glymma situated in apical 0.6–0.7 of first tergite. [Malar space about as long as basal width of mandible. Ovipositor with weak dorsal subapical depression, without teeth, its sheath about twice as long as first tergite.] (Subgenus *Gonolochus* Förster) ..... ***T. caudatus***

– Second tergite 0.8–1.5 times as long as anteriorly broad (Figs 13, 17, 27, 30, 40, 49, 60, 70). Thyridial depression short, distinctly transverse or as long as broad (Figs 13, 17, 27, 30, 40, 49, 60, 70) (except *T. fidicinus* sp. n. with thyridial depression 1.5 times as long as broad). First tergite shorter, 2.5–3.0 times as long as posteriorly broad (Figs 27, 30, 40, 60, 70) (except *T. granulatus* with first tergite 4.5 times as long as broad, Fig. 17), usually striate laterally, with glymma often deep and large, and usually situated at or slightly behind center of first tergite. (Subgenus *Tersilochus* s. str.) **2**

2 Mesopleuron centrally distinctly punctate, smooth between punctures (Fig. 46). Fore wing with metacarpus almost reaching apex of fore wing. Finger-shaped subapical structures present on outer surface of flagellomeres 2 to 6 (Fig. 44). Flagellum with 26 segments (Fig. 43). Ovipositor very short, its sheath about 0.6 times as long as first tergite (Figs 48, 50) ..... ***T. punctator* sp. n.**

– Mesopleuron densely granulate, impunctate or with fine punctures (Figs 2, 9, 24, 29, 56, 66). Fore wing with metacarpus not reaching apex of fore wing (Figs 11, 25, 35, 58, 69). Finger-shaped subapical structures absent on flagellomere 2, present on flagellomeres 3(4) to 6(7) (Figs 8, 21, 34, 55, 65). Flagellum with 17–21 segments (Figs 1, 7, 20, 28, 31, 54, 64). Ovipositor

longer, sometimes very long, its sheath 0.7–3.0 times as long as first tergite (Figs 3, 12, 18, 26, 36, 59, 68) **3**

3 Head, in dorsal view, weakly to moderately rounded and very strongly tapered behind eyes (Figs 16, 53). Clypeus flat (Fig. 52). Small species with body length 3.2–4.0 mm and fore wing length 2.4–2.8 mm..... **4**

– Head, in dorsal view, strongly rounded, weakly tapered just behind eyes (Figs 6, 19, 33, 63). Clypeus conspicuously bent backwards in lower 0.3–0.4 (with transverse bend, as in European *T. jocator* Holmgren; except *T. obstinatus* sp. n., which has clypeus strongly truncate, probably abnormal). Body length 3.7–5.1 mm and fore wing length 2.8–3.9 mm..... **5**

4 Propodeum with basal keel (Fig. 17); all carinae weak (sometimes partly indistinct), without adjacent wrinkles. First tergite brown, entirely smooth, very slender, about 4.5 times as long as broad posteriorly (Figs 15, 17). Second tergite elongate, about 1.5 times as long as broad anteriorly (Fig. 17). Ovipositor without dorsal subapical teeth, its sheath about 0.75 times as long as first tergite ..... ***T. granulatus*** Khalaim

– Propodeum with basal area (Fig. 57); all carinae strong, transverse carina with short adjacent wrinkles (Fig. 57). First tergite black, less slender, 3.0 times as long as broad posteriorly, with petiole distinctly striate laterally and dorsally (Fig. 60). Second tergite transverse, 0.8 times as long as broad anteriorly (Fig. 60). Ovipositor with two dorsal subapical teeth (Fig. 61), its sheath 1.25 times as long as first tergite (Fig. 59)..... ***T. serratus*** **sp. n.**

5 Eyes conspicuously enlarged; temple short, almost 0.6 times as long as eye width (Fig. 33). [Flagellum brown (Fig. 31). Metasoma behind first tergite brownish yellow (Fig. 36). Ovipositor short, with dorsal subapical notch, its sheath as long as first tergite (Figs 36, 37).]..... ***T. obstinatus*** **sp. n.**

– Eyes not enlarged; temple longer, 0.75–0.85 times as long as eye width (Figs 6, 19, 63)..... **6**

6 Eyes with inner orbits weakly but distinctly convergent dorsally (Fig. 5). Ovipositor short, apically clavate, its sheath slightly shorter than first tergite (Fig. 12)..... ***T. gangwonus*** **sp. n.**

– Eyes with inner orbits more or less parallel (Figs 23, 62). Ovipositor apically not clavate, its sheath sometimes much longer than first tergite (Figs 3, 26, 68) **7**

7 Malar space short, 0.4–0.6 times as long as basal width of mandible..... **8**

– Malar space almost as long as basal width of mandible..... **9**

8 Metasoma behind first tergite yellow-brown (Figs 18, 26). Thyridial depression strongly transverse (Fig. 27). Ovipositor short, apically thin and without distinct dorsal notch, its sheath 0.7 times as long as first tergite (Fig. 26)..... ***T. iracundus*** **sp. n.**

– Metasoma behind first tergite predominantly dark brown (Fig. 3). Thyridial depression 1.5 times as long as broad. Ovipositor longer, with sharp dorsal subapical notch (Fig. 4), its sheath 1.7–1.8 times as long as first tergite (Fig. 3) ..... ***T. fidicinus*** **sp. n.**

9 Propodeal spiracle separated from pleural carina by 2.0–2.5 times diameter of spiracle (Fig. 29). Flagellum with finger-shaped subapical structures on outer surface of flagellomeres 4 to 7. Ovipositor short and robust, evenly upcurved, with sharp dorsal subapical notch, its sheath 1.25 times as long as first tergite ..... ***T. nigellus* sp. n.**

– Propodeal spiracle adjacent to pleural carina (Fig. 66). Flagellum with finger-shaped subapical structures on outer surface of flagellomeres 3 to 6 (Fig. 65). Ovipositor much longer, apically thin and strongly upcurved, its sheath almost 3.0 times as long as first tergite (Fig. 68) ..... ***T. uncinatus* sp. n.**

***Tersilochus* (*Gonolochus*) *caudatus* (Holmgren, 1860)**
http://species-id.net/wiki/Tersilochus_caudatus

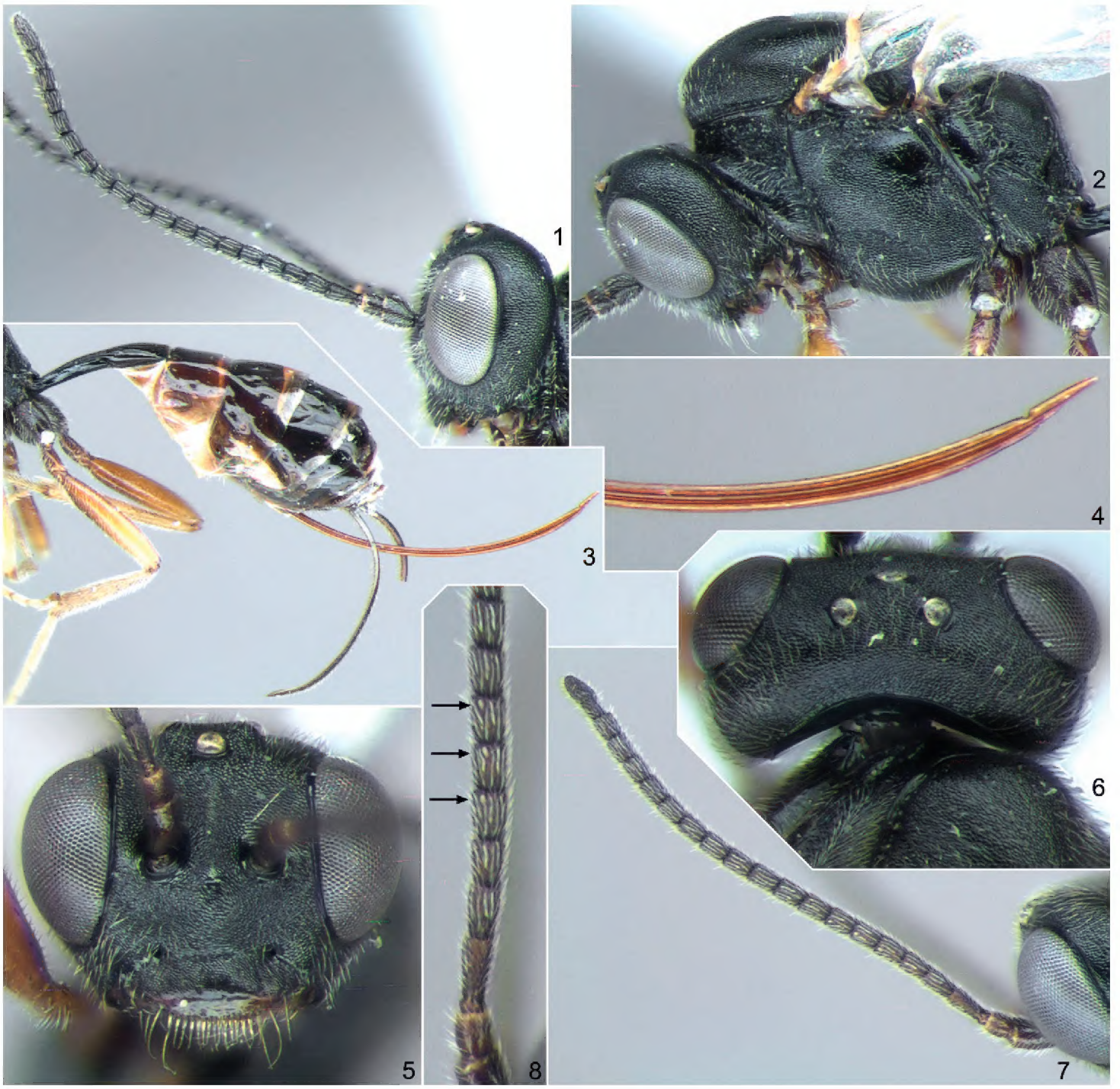
Material examined. South Korea, Gangwon-do (GW), Taebaek-si, Tong-dong, Yeonhwasan, 37°09'00.89"N, 129°00'10.41"E, 14.V.1997, 1 female.

Distribution. Widespread transpalaearctic species. First record from South Korea.

***Tersilochus* (*Tersilochus*) *fidicinus* Khalaim & Lee, sp. n.**
http://zoobank.org/CD6518A9-E696-4130-93EE-CDF1AD227329
http://species-id.net/wiki/Tersilochus_fidicinus
Figs 1–4

Description. *Female* (holotype). Body length 4.8 mm. Fore wing length about 3.9 mm (apices of both wings absent).

Head roundly constricted behind eyes in dorsal view (as in Fig. 6); temple 0.84 times as long as eye width. Inner eye orbits parallel. Mandible with upper tooth much longer than lower tooth. Clypeus lenticular, 3.0 times as broad as long, in profile convex, with lower 0.3 bent backwards; sparsely punctate, very finely granulate and dull in upper 0.7. Malar space 0.5–0.6 times as long as basal width of mandible. Flagellum of antenna filiform, with 19 segments in holotype and 17 in paratype (Fig. 1); subbasal flagellomeres about 1.4 times and subapical flagellomeres about 1.2 times as long as broad; flagellomeres 4 to 6 with distinct subapical finger-shaped structures on outer surface. Face, frons, vertex, and temple distinctly granulate, dull, and impunctate. Mesosoma almost entirely densely granulate; lateral lobes of mesoscutum with fine punctures, and upper posterior corner of mesopleuron finely punctate on almost smooth and shining background. Notaulus very weak, with indistinct wrinkles. Foveate groove very weak, narrow, and short, situated in center of mesopleuron (Fig. 2). Propodeum mediodorsally with fine longitudinal wrinkles; basal part 0.43 times as long as apical area. Propodeal spiracle separated from pleural carina by 1.5–2.0 times diameter of spiracle (Fig. 2). Apical area almost flat, anteriorly widely rounded. Apical longitudinal carinae weak but complete. Fore wing with intercubitus rather long, equal



Figures 1–8. *Tersilochus fidicinus* sp. n., female, holotype: **1** head with antenna, lateral view **2** head and mesosoma, lateral view **3** metasoma with ovipositor, lateral view **4** apex of ovipositor, lateral view. *Tersilochus gangwonus* sp. n., female, holotype (Figs **5**, **6**) and paratype (Figs 7, **8**): **5** head, frontal view **6** head, dorsal view **7** antenna, lateral view **8** base of antenna, lateral view.

by length to abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted somewhat below middle. Hind wing with nervellus slightly reclivous or vertical. Metasoma: first tergite 2.8 times as long as broad posteriorly, mostly smooth; petiole trapeziform in cross-section, very finely striate laterally. Glymma deep, situated slightly behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad. Thyridial depression deep, about 1.5 times as long as broad. Ovipositor evenly upcurved, with deep and sharp dorsal subapical notch (Figs 3, 4); sheath 1.8 times as long as first tergite.

Head (including clypeus), mesosoma, and first tergite black; palpi brownish yellow to brown; tegula yellow. Mandible blackish in basal 0.4, reddish brown centrally and with teeth reddish black. Antenna entirely black. Pterostigma brown with whitish marks on proximal and distal corners. Legs brownish yellow; coxae brownish black; first trochanters brownish. Metasoma behind first tergite predominantly dark brown.

Male. Unknown.

Comparison. Differs from other species of the genus by the combination of long temple, granulate and impunctate head, and mesosoma (Figs 1, 2), weak foveate groove of mesopleuron (Fig. 2), elongate thyridial depression, and long ovipositor with sharp dorsal subapical notch (Figs 3, 4).

Variation. Paratype almost exactly corresponds with the holotype. In paratype, flagellomeres are slightly shorter, propodeum is with weak basal keel, and ovipositor is slightly shorter than in the holotype.

Type material. Holotype female, South Korea, Gangwon-do (GW), Taebaek-si, Hyeoldong, Mt. Taebaek, 37°05'N, 128°54'E, 14.V.1992, coll. J.W. Lee (YUG).

Paratype. 1 female (ZISP), South Korea, Gyeongbuk-do (GB), Uljin-gun, Seomyeon, Wangpi-ri, Wangpicheon, Parkdaljae, Malaise trap, 24.VI–31.VII.2012, coll. J.K. Choi.

Distribution. South Korea.

Etymology. Named after the Latin *fidicinus* (of lute playing).

***Tersilochus* (*Tersilochus*) *gangwonus* Khalaim & Lee, sp. n.**

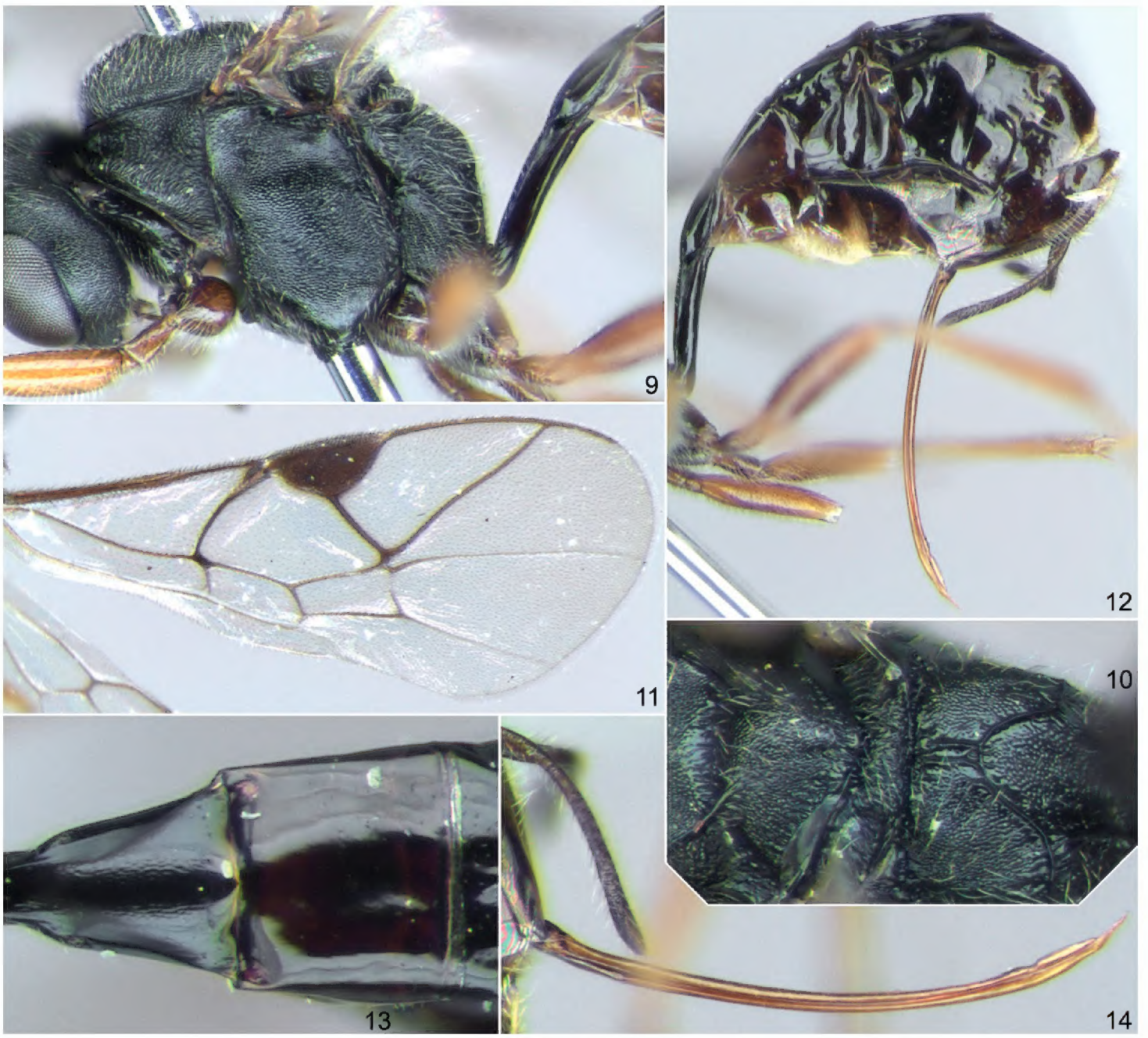
http://zoobank.org/FDFC6D32-1939-4731-BCD6-7FECE1D2FC0B

http://species-id.net/wiki/Tersilochus_gangwonus

Figs 5–14

Description. *Female* (holotype). Body length 4.2 mm. Fore wing length 3.35 mm.

Head strongly rounded behind eyes in dorsal view (Fig. 6); temple 0.75 times as long as eye width. Inner eye orbits weakly but distinctly convergent dorsally (Fig. 5). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 2.5 times as broad as long, in profile convex, with lower 0.4 bent backwards (Fig. 5); sparsely punctate, finely granulate, and dull in upper 0.7. Malar space about as long as basal width of mandible. Flagellum of antenna filiform, with 19 segments (Fig. 7); subbasal flagellomeres 1.4–1.5 times as long as broad, subapical flagellomeres slightly elongate; flagellomeres 4 to 6 with distinct subapical finger-shaped structures on outer surface (Fig. 8, arrows). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 5, 6). Mesosoma entirely densely granulate, dull, and impunctate (Fig. 9); mesopleuron centrally with fine oblique or horizontal striae on granulate background. Notaulus absent. Foveate groove weak, narrow, and short. Propodeum mediodorsally with fine longitudinal wrinkles (Fig. 10); basal part 0.35 times as long as apical area. Propodeal spiracle separated from pleural carina by 0.7–1.0 times diameter of spiracle. Apical area flat, anteriorly widely rounded (Fig. 10). Apical longitudinal carinae anteriorly weak.



Figures 9–14. *Tersilochus gangwonus* sp. n., female, holotype: **9** head, mesosoma and first tergite, lateral view **10** mesoscutum and propodeum, dorsolateral view **11** fore wing **12** metasoma with ovipositor, lateral view **13** postpetiole and second tergite, dorsal view **14** ovipositor, lateral view.

Fore wing (Fig. 11) with intercubitus thickened, about as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.7 times as long as broad posteriorly, mostly smooth; petiole trapeziform in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma. Glymma deep, situated somewhat behind center of first tergite, joining by distinct furrow to ventral part of postpetiole (Figs 9, 12). Second tergite as long as anteriorly broad (Fig. 13). Thyridial depression short, as long as broad in the holotype (Fig. 13) and transverse in the paratype. Ovipositor short and robust, weakly upcurved, clavate, with rather sharp dorsal subapical notch (Fig. 14); sheath 0.85 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi and lower 0.4 of clypeus brown; mandible yellow-brown, fuscous basally, and with reddish teeth; tegula yellow. An-

tenna entirely black. Pterostigma brown. Legs brownish yellow; coxae brownish black, first trochanters brownish. Metasoma behind first tergite dark brown.

Male. Unknown.

Comparison. Differs from other Korean species of the genus *Tersilochus* by the combination of inner eye orbits convergent dorsally (Fig. 5), and short and clavate ovipositor apically with rather sharp dorsal subapical depression (Figs 12, 14).

Variation. Paratype corresponds well with the holotype but has somewhat less clavate ovipositor and shorter thyridial depression.

Type material. Holotype female, South Korea, Gangwon-do (GW), Taebaek-si, Sodo-dong Mt. Taebaek, Danggol valley, 37°05'N, 128°56'E, 5.V.1999, coll. J.W. Lee (YUG).

Paratype. 1 female (ZISP), South Korea, Gangwon-do (GW), Taebaek-si, Hyeol-dong, Mandeoksa, 37°07'06"N, 128°56'52"E, 6.V.1999, coll. J.W. Lee.

Distribution. South Korea.

Etymology. Named after the type locality, Gangwon province of South Korea.

***Tersilochus* (*Tersilochus*) *granulatus* Khalaim, 2011**

http://species-id.net/wiki/Tersilochus_granulatus

Figs 15–17

Comparison. Differs from other Korean species of the genus by an evenly granulate propodeum with basal keel (Fig. 17), very slender brown first tergite (Figs 15, 17), and distinctly elongate second tergite (Fig. 17).

Remarks. Flagellum with finger-shaped subapical structures present on outer surface of flagellomeres 4 to 6; these structures in this species are very small, inconspicuous, and hardly visible under a light microscope.

Distribution. South Korea: Gyeongsangnam-do (GN).

***Tersilochus* (*Tersilochus*) *iracundus* Khalaim & Lee, sp. n.**

http://zoobank.org/83AB92C8-1729-4ADA-9F15-286F4861DAE5

http://species-id.net/wiki/Tersilochus_iracundus

Figs 18–27

Description. *Female* (holotype). Body length 3.7 mm. Fore wing length 2.8 mm.

Head strongly rounded behind eyes in dorsal view (Fig. 19); temple 0.74 times as long as eye width. Inner eye orbits parallel (Fig. 23). Mandible with upper tooth much longer than lower tooth. Clypeus lenticular, almost 3.0 times as broad as long, in profile convex, with lower 0.4 bent backwards (Fig. 23); sparsely punctate, finely granulate, and dull in upper 0.7. Malar space 0.4 times as long as basal width of mandible. Flagellum of antenna weakly tapered towards apex, with 19 segments (Fig. 20); subbasal flagellomeres 1.3–1.4 times, and subapical flagellomeres about 1.2 times

Figures 15–22. *Tersilochus granulatus* Khalaim, female, holotype (Figs **15**, **16**) and paratype (Fig. **17**): **15** habitus (without apices of wings and ovipositor), lateral view **16** head and anterior part of mesoscutum, dorsal view **17** propodeum and base of metasoma, dorsal view. *Tersilochus iracundus* sp. n., female, holotype: **18** habitus (without wings), lateral view **19** head and anterior part of mesoscutum, dorsal view **20** antenna, lateral view **21** base of antenna, lateral view **22** propodeum and hind coxae, dorsal view.

as long as broad; flagellomeres 4–6 with distinct and flagellomere 7 with rudimental subapical finger-shaped structures on outer surface (Fig. 21). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 19, 23).

Mesosoma entirely granulate, dull, impunctate; mesopleuron centrally with fine oblique striae on granulate background (Fig. 24). Notaulus absent. Foveate groove weak and short, oblique, situated in anterior half of mesopleuron (Fig. 24). Propodeum with narrow basal area, which is 0.4 times as long as apical area (Fig. 22). Propodeal spiracle separated from pleural carina by 1.5 times diameter of spiracle. Apical area slightly impressed, anteriorly rounded (Fig. 22). Apical longitudinal carinae developed in posterior half, anteriorly absent. Fore wing (Fig. 25) with intercubitus thickened, as long as abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius slightly longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. First tergite almost 3.0 times as long as broad posteriorly, mostly smooth, with petiole more or less round in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma (Fig. 27). Glymma deep, situated somewhat behind center of first tergite, joining by distinct furrow to ventral part of postpetiole (Fig. 26). Second tergite as long as anteriorly broad (Fig. 27). Thyridial depression short, transverse. Ovipositor short, slender, almost straight basally and upcurved in apical 0.3, with fine teeth dorsally and ventrally at apex (Fig. 26); sheath 0.7 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (except reddish black teeth), and lower 0.3 of clypeus yellow-brown; tegula yellow. Antenna dark brown. Pterostigma brown. Legs brownish yellow; fore and mid coxae weakly brown, and hind coxa strongly brown. Metasoma behind first tergite yellow-brown.

Male. Unknown.

Comparison. Differs from other Palaearctic species of *Tersilochus* by the combination short malar space, reddish brown behind first tergite of metasoma (Figs 26, 27) and short ovipositor (Fig. 26).

Type material. Holotype female, South Korea, Chungbuk-do (CB), Jecheon-si, Deoksan-myeon, Worak-ri, Deoksanmaepyoso, 36°52'N, 128°13'E, Malaise trap, 6–20.V.2006, coll. J.W. Lee (YUG).

Distribution. South Korea.

Etymology. Named after the Latin *iracundus* (angry, hot-tempered, furious).

***Tersilochus* (*Tersilochus*) *nigellus* Khalaim & Lee, sp. n.**

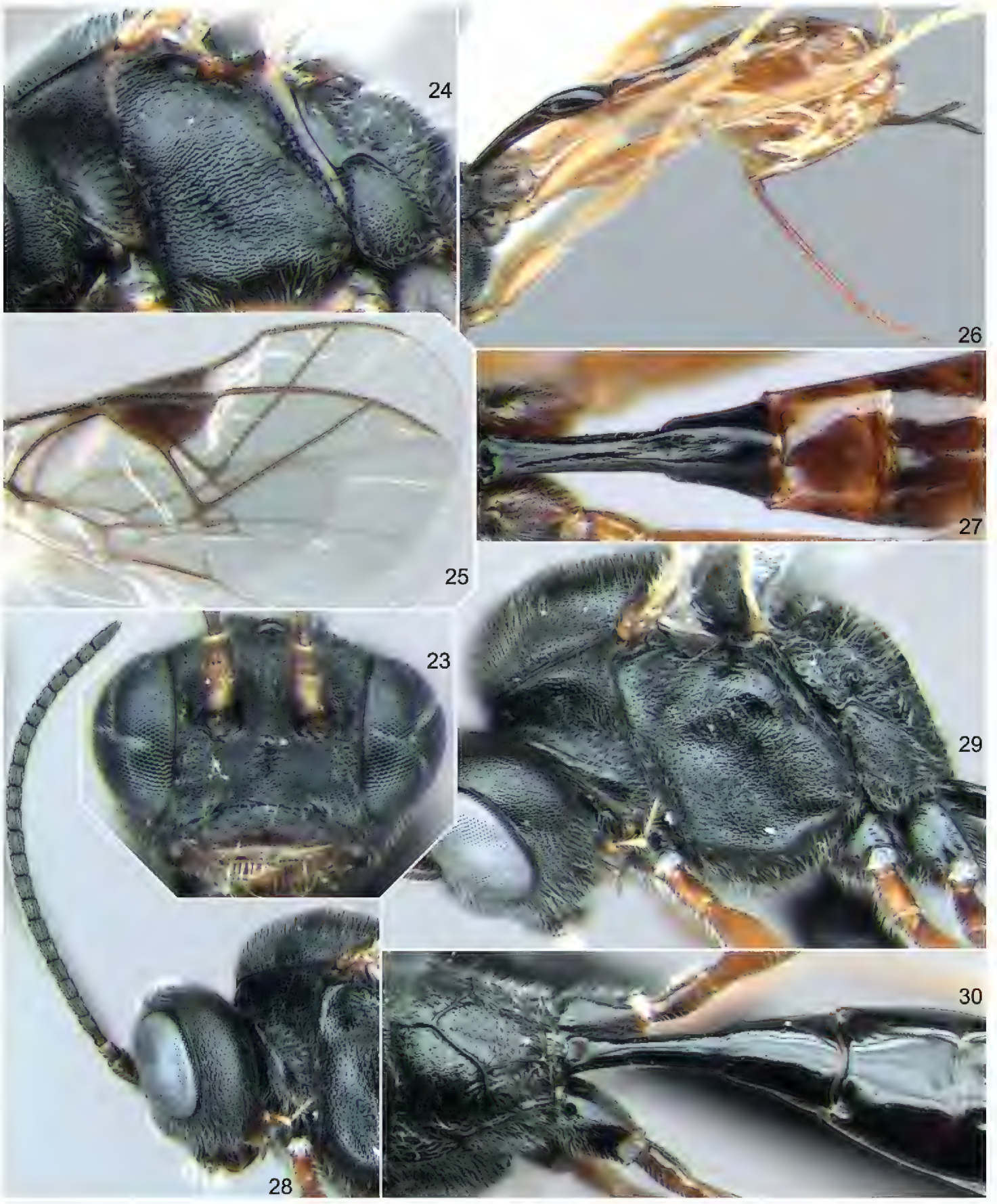
http://zoobank.org/3A477F29-AB5D-4141-A92E-C7A2ED9EAF41

http://species-id.net/wiki/Tersilochus_nigellus

Figs 28–30

Description. *Female* (holotype). Body length 5.1 mm. Fore wing length 3.8 mm.

Head strongly rounded behind eyes in dorsal view; temple 0.85 times as long as eye width. Inner eye orbits parallel. Mandible with upper tooth distinctly longer than lower tooth. Clypeus lenticular, 2.7 times as broad as long, in profile slightly convex, with lower 0.3 bent backwards; sparsely punctate, finely granulate, and dull in upper half. Malar space almost as long as basal width of mandible. Flagellum of antenna weakly tapered towards



Figures 23–30. *Tersilochus iracundus* sp. n., female, holotype: **23** head, frontal view **24** mesosoma, ventrolateral view **25** fore wings **26** metasoma with ovipositor, lateral view **27** tergites 1–3 of metasoma, dorsal view. *Tersilochus nigellus* sp. n., female, holotype: **28** head with antenna and anterior part of mesosoma, lateral view **29** mesosoma, lateral view **30** propodeum and base of metasoma, dorsolateral view.

apex, with 21 segments in the holotype and 20 segments in the paratype (Fig. 28); subbasal flagellomeres 1.3–1.5 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 4 to 7 with subapical finger-shaped structures on outer surface. Face, frons, vertex, and temple distinctly granulate and dull; face and frons of holotype also with indis-

tinct punctures. Mesosoma entirely granulate, dull, and mostly impunctate; mesopleuron finely and rather densely punctate on finely granulate background (Fig. 29). Notaulus as very weak wrinkle or tubercle. Foveate groove weak and short, situated in anterior half of mesopleuron. Propodeum with basal keel, which is 0.31 times as long as apical area (Fig. 30). Propodeal spiracle separated from pleural carina by 2.0–2.5 times diameter of spiracle (Fig. 29). Apical area flat, anteriorly slightly pointed (Fig. 30). Apical longitudinal carinae anteriorly weak. Fore wing with intercubitus longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius distinctly longer than width of pterostigma. Metacarpus not reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical or slightly reclivous. Metasoma: first tergite 2.6 times as long as broad posteriorly, mostly smooth, with petiole slightly depressed, oval in cross-section, well separated from postpetiole in dorsal view, finely striate laterally before glymma. Glymma deep, situated in apical 0.6 of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad (Fig. 30). Thyridial depression short, transverse (Fig. 30). Ovipositor evenly upcurved, thickened near apex, with deep and sharp dorsal subapical notch; sheath 1.25 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi and lower 0.3 of clypeus reddish brown; mandible reddish brown with blackish base and teeth; tegula yellow. Antenna with scape and pedicel brownish black and flagellum entirely black. Pterostigma brown. Legs brownish yellow; fore coxa brown basally; mid and hind coxae brownish black; first trochanter of hind leg dark brown. Metasoma behind first tergite dark brown ventrally to brownish black dorsally.

Male. Unknown.

Comparison. Similar to *T. fidicinus* sp. n. but differs by the longer malar space, finely punctate mesopleuron (Fig. 29), propodeum with distinct basal keel (Fig. 30), and shorter thyridial depression (Fig. 30).

Variation. Paratype almost exactly corresponds with the holotype with no obvious variation.

Type material. Holotype female, South Korea, Jeonnam-do (JN), Jeongeup-si, Jangseong-gun, Bukha-myeon, Namchanggol, Malaise trap, Site 18, 19.V.2005, coll. D.K. Jung (YUG).

Paratype. 1 female (ZISP), South Korea, Gyeongbuk-do (GB), Cheongdo-gun, Maejeon-myeon, 35°40'N, 128°50'E, 17.IV.1992, coll. J.W. Lee.

Etymology. Named after the Latin *nigellus* (somewhat black), on account of its almost entirely black body.

Tersilochus (*Tersilochus*) *obstinatus* Khalaim & Lee, sp. n.

http://zoobank.org/CCB8684F-8DD3-48AB-99E2-57DFABEB0AB6
http://species-id.net/wiki/Tersilochus_obstinatus
Figs 31–40

Description. *Female* (holotype). Body length 4.5 mm. Fore wing length 3.35 mm.

Figures 31–37. *Tersilochus obstinatus* sp. n., female, holotype: **31** head with antennae and mesosoma, anterolateral view **32** head, frontal view **33** head, dorsal view **34** base of antenna, lateral view **35** fore wing **36** metasoma with ovipositor, lateral view **37** apex of metasoma with ovipositor, lateral view.

Head very strongly rounded behind eyes in dorsal view (Fig. 33); temple short, almost 0.6 times as long as eye width. Inner eye orbits weakly but distinctly convergent dorsally (Fig. 32). Mandible with upper tooth distinctly longer than lower tooth. Clypeus probably abnormal, with lower margin abruptly bent backwards (Fig. 32); distinctly and sparsely punctate on finely granulate and dull background. Malar space 0.85 times as long as basal width of mandible. Flagellum of antenna filiform, with 18 segments (Fig. 31); subbasal flagellomeres about 1.5 times as long as broad,

subapical flagellomeres slightly elongate; flagellomeres 3 to 7 with distinct subapical finger-shaped structures on outer surface (Fig. 34). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate. Mesosoma entirely granulate, dull, and mostly impunctate; mesoscutum laterally with indistinct punctures. Notaulus absent. Foveate groove situated in anterior half of mesopleuron, not reaching prepectal carina anteriorly, almost straight, narrow, slightly oblique, with transverse wrinkles ventrally (Fig. 31). Propodeum with basal keel (and few fine subparallel wrinkles), which is 0.37 times as long as apical area (Fig. 38). Propodeal spiracle separated from pleural carina by 1.75 times diameter of spiracle. Apical area flat, anteriorly widely rounded (Fig. 38). Apical longitudinal carinae distinct only posteriorly, anteriorly absent. Fore wing (Fig. 35) with intercubitus thick, shorter than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius almost as long as width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted somewhat below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.5 times as long as broad posteriorly (Fig. 40), with petiole trapeziform in cross-section, well separated from postpetiole in dorsal view, mostly smooth dorsally and laterally, finely striate laterally before glymma, and with postpetiole striate dorsally. Glymma deep, situated at center of first tergite, joining by distinct furrow to ventral part of postpetiole (Fig. 39). Second tergite as long as anteriorly broad (Fig. 40). Thyridial depression short, transverse (Fig. 40). Ovipositor short, weakly upcurved, with moderately deep and sharp dorsal subapical notch (Fig. 37); sheath about as long as first tergite (Fig. 36).

Head, mesosoma, and first tergite black; palpi and lower margin of clypeus yellowish brown; mandible yellowish brown, blackish basally and with black teeth; tegula yellow. Antenna brown. Pterostigma brown. Legs brownish yellow, hind coxa brownish. Metasoma behind first tergite brownish yellow (Fig. 36), tergites 3 to 5 dorsally with brown anterior marks.

Male. Unknown.

Comparison. Differs from other Palaearctic species of *Tersilochus* by the combination of conspicuously enlarged eyes (temple short) (Figs 32, 33), short ovipositor (Fig. 36) and light brownish yellow metasoma behind first tergite (Fig. 36).

Type material. Holotype female, South Korea, Chungnam-do, (CN), Daejeon, Dong-gu, Daejeon University, 35°31'17"N, 126°50'12"E, Malaise trap, 13–28. IV.2006 (YUG).

Distribution. South Korea.

Etymology. Named after the Latin *obstinatus* (firm, resolved, resolute, obstinate).

Tersilochus (*Tersilochus*) *punctator* Khalaim & Lee, sp. n.

http://zoobank.org/FDF24F38-F715-40F4-928D-6F4203C2C3C6
http://species-id.net/wiki/Tersilochus_punctator
Figs 41–51

Description. *Female* (holotype). Body length 5.2 mm. Fore wing length 4.4 mm.

Figures 38–44. *Tersilochus obstinatus* sp. n., female, holotype: **38** propodeum, dorsal view **39** base of metasoma, lateral view **40** base of metasoma, lateral view. *Tersilochus punctator* sp. n., female, holotype: **41** head and anterior part of mesosoma, dorsal view **42** head, frontal view **43** antenna, lateral view **44** base of antenna, lateral view.

Head rounded behind eyes in dorsal view (Fig. 41); temple 0.72 times as long as eye width. Inner eye orbits more or less parallel (Fig. 42). Mandible with upper tooth somewhat longer than lower tooth. Clypeus lenticular with lower margin slightly truncate, 2.9 times as broad as long, smooth, and sparsely punctate in upper 0.6, in profile weakly convex (Fig. 42). Malar space 0.8 times as long as basal width of mandible. Flagellum of antenna distinctly tapered towards apex, with 26 segments (Fig. 43); subbasal flagellomeres 1.5–1.6 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 2 to 6 with small subapical finger-shaped structures on

outer surface (Fig. 44, arrows). Face, frons, and vertex densely punctate on granulate surface and dull (Figs 41, 42). Temple moderately densely punctate, almost smooth, and weakly shining between punctures. Notaulus with irregular wrinkles. Mesoscutum granulate, finely and densely punctate. Foveate groove about 0.8 times as long as mesopleuron, weakly curved, narrow, with fine transverse wrinkles, not reaching prepectal carina anteriorly (Fig. 46). Mesopleuron distinctly punctate, granulate, and dull below foveate groove, and mostly smooth and shining between punctures above foveate groove (Fig. 46). Propodeum mediodorsally with strong median and two weaker lateral wrinkles, basal part 0.38 times as long as apical area (Fig. 47). Dorsolateral area of propodeum finely granulate, finely and sparsely punctate. Propodeal spiracle separated from pleural carina by almost 2.0 times diameter of spiracle (Fig. 45). Apical area flat, anteriorly rounded (Fig. 47). Apical longitudinal carinae distinct posteriorly and indistinct anteriorly. Fore wing with intercubitus thickened, somewhat longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius longer than width of pterostigma. Metacarpus almost reaching apex of fore wing. Postnervulus intercepted below middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.5 times as long as broad posteriorly, mostly smooth, with petiole trapeziform in cross-section and well separated from postpetiole in dorsal view. Glymma small, situated in apical 0.6 of first tergite, joining by distinct furrow to ventral part of postpetiole (Figs 45, 48). Second tergite distinctly transverse, 0.8 times as long as anteriorly broad (Fig. 49). Thyridial depression as long as broad (Fig. 49). Ovipositor very short, weakly upcurved, thickened near apex, with dorsal subapical depression and small notch before this depression (Fig. 50, arrow); sheath 0.6 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (teeth reddish black), lower 0.3 of clypeus, and tegula brownish yellow. Antenna with scape and pedicel yellow-brown, flagellum black. Pterostigma dark brown. Legs brownish yellow; fore and mid coxae basally brown; hind coxae brownish black; hind femur centrally with brownish black mark on outer side. Metasoma behind first tergite predominantly yellow-brown ventrally and laterally, tergites 2 and 3 dorsally extensively black with narrow yellow-brown band posteriorly, tergites 4 and 5 with dorsal blackish areas smaller.

Male. Unknown.

Comparison. This is the only species of the genus *Tersilochus* in South Korea with densely punctate mesopleuron (Fig. 46). It differs from other Palaearctic species of *Tersilochus* by the combination of densely punctate and smooth mesopleuron between punctures, well-developed foveate groove (Fig. 46), long metacarpus, and very short ovipositor (Figs 48, 50). It is similar to the Russian Far East *T. grandiculus* Khalaim but distinct in having less slender flagellum of antenna, less punctate head, and shorter second tergite.

Remarks. One female from southeast China generally corresponds well with this species (including small subapical finger-shaped structures on flagellomeres 2–5) but has a flagellum with 20 segments, mesopleuron with weaker punctures and centrally

Figures 45–51. *Tersilochus punctator* sp. n., female, holotype (except Fig. **51**): **45** mesosoma and first tergite, lateral view **46** head and mesopleuron, anterolateral view **47** propodeum, dorsal view **48** metasoma, lateral view **49** first tergite, dorsal view **50** apex of metasoma with ovipositor, lateral view **51** ovipositor, lateral view (China).

mostly finely granulate, propodeal spiracle separated from pleural carina by half diameter of spiracle, thyridial depression almost twice as long as broad, and ovipositor strongly clavate, with conspicuous dorsal subapical depression and rounded tooth before this depression (Fig. 51). This specimen may belong to an undescribed species, so study of an additional material is needed.

Type material. Holotype female, South Korea, Gyeongbuk-do (GB), Yeongju-si, Punggi-eup, Jungnyeong, 35°53'42.7"N, 128°26'22.0"E, Malaise trap, Site-99, 3–12. VI.2009, coll. C.J. Kim (YUG).

Additional material. China, Jiangxi reg., Jiulianshan, 27.IV.2011, coll. M.-L. Sheng, 1 female (deposited in General Station of Forest Pest Management, State Forestry Administration, P.R. China).

Distribution. South Korea, ?China (Jiangxi).

Etymology. Named on account of its densely punctate mesopleuron.

***Tersilochus* (*Tersilochus*) *serratus* Khalaim & Lee, sp. n.**

http://zoobank.org/04B906EC-FEE8-450B-94E6-A38F9B4133BA

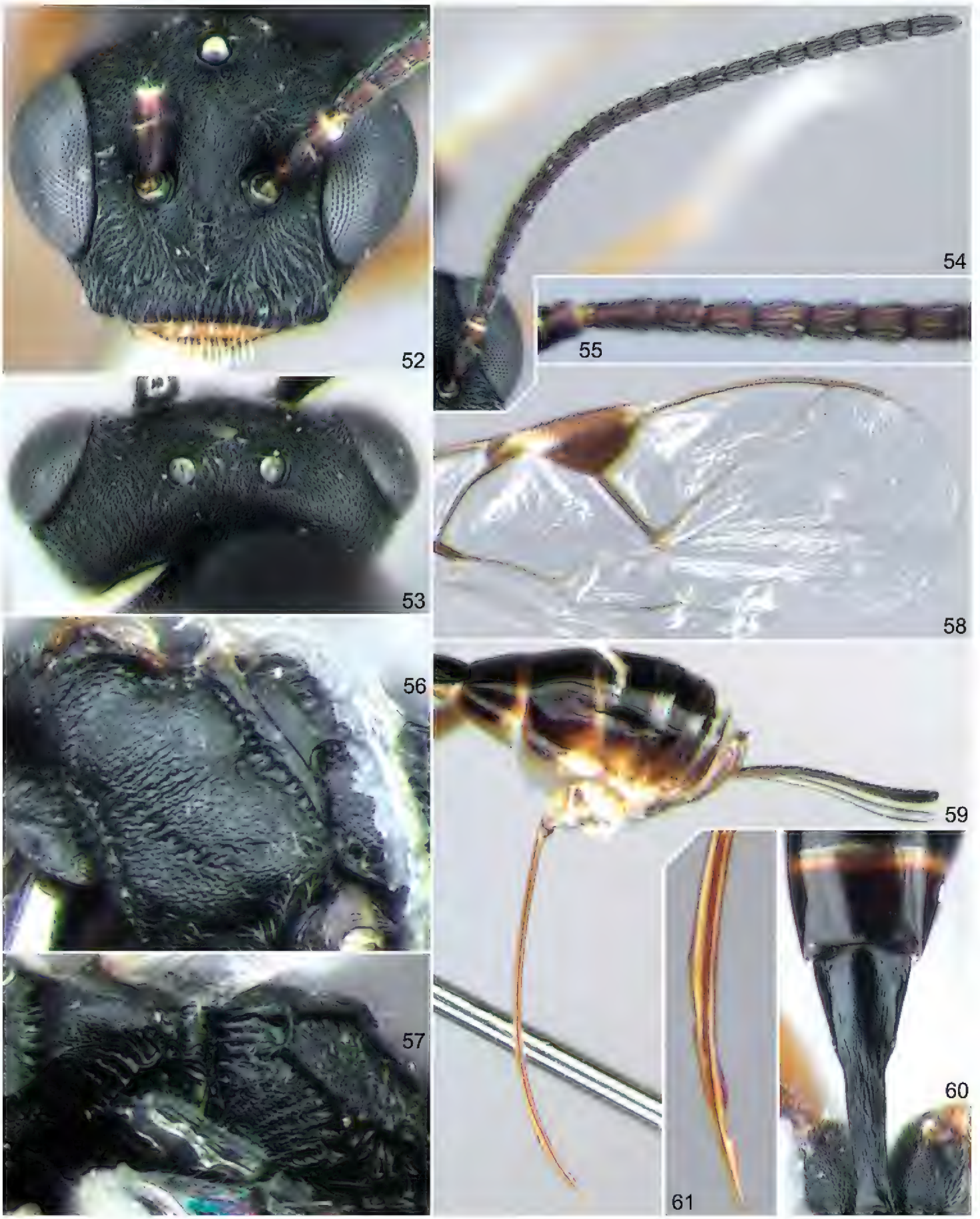
http://species-id.net/wiki/Tersilochus_serratus

Figs 52–61

Description. *Female* (holotype). Body length 4.0 mm. Fore wing length 2.8 mm.

Head weakly rounded and strongly narrowed behind eyes in dorsal view (Fig. 53); temple 0.72 times as long as eye width. Inner eye orbits very weakly divergent dorsally (Fig. 52). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 3.2 times as broad as long, in profile flat, finely granulate and indistinctly punctate in upper 0.7. Malar space as long as basal width of mandible. Flagellum of antenna filiform, with 21 segments (Fig. 54); all flagellomeres 1.2–1.4 times as long as broad; flagellomeres 4–6 with distinct subapical finger-shaped structures on outer surface (Fig. 55). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 52, 53). Mesosoma entirely granulate, dull, and impunctate; mesopleuron centrally with fine, slightly oblique striae on granulate background (Fig. 56). Notaulus absent. Foveate groove weak, with fine transvers wrinkles, oblique, situated in anterior 0.6 of mesopleuron (Fig. 56). Propodeum with rectangular basal area, which is about 1.5 times as long as broad and 0.35 times as long as apical area (Fig. 57); transverse carina with short adjacent wrinkles (Fig. 57). Propodeal spiracle adjacent to pleural carina. Apical area flat, anteriorly truncate (Fig. 57), posteriorly with transverse wrinkles. Apical longitudinal carinae well-developed, reaching transverse carina anteriorly. Fore wing (Fig. 58) with intercubitus slightly longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius somewhat longer than width of pterostigma. Metacarpus ending far from apex of fore wing. Postnervulus intercepted distinctly below middle. Hind wing with nervellus distinctly reclivous. Metasoma: first tergite almost 3.0 times as long as broad posteriorly, with petiole trapeziform in cross-section, entirely striate dorsally and laterally (Fig. 60), and with postpetiole smooth (except base) and well separated from petiole in dorsal view. Glymma deep, situated behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite distinctly transverse, 0.8 times as long as anteriorly broad (Fig. 60). Thyridial depression short, distinctly transverse (Fig. 60). Ovipositor slender, upcurved, with two distinct subapical teeth dorsally and deep depression between these teeth (Figs 59, 61); sheath 1.25 times as long as first tergite.

Head, mesosoma, and first tergite black; palpi, mandible (except reddish black teeth), and lower 0.3 of clypeus yellow-brown; tegula yellow. Antenna dark brown.



Figures 52–61. *Tersilochus serratus* sp. n., female, holotype: **52** head, frontal view **53** head, dorsal view **54** antenna, frontal view **55** base of antenna, lateral view **56** mesopleuron, ventrolateral view **57** scutellum and propodeum, dorsolateral view **58** fore wing **59** apex of metasoma with ovipositor, lateral view **60** first and second tergites, dorsal view **61** apex of ovipositor, lateral view.

Pterostigma brown with conspicuous white spots on its proximal and distal corners (Fig. 58). Legs brownish yellow; fore and mid coxae weakly, and hind coxa strongly darkened with brown. Metasoma behind first tergite yellow-brown ventrally and pre-

dominantly dark brown to brownish black laterally and dorsally; tergites 2 and 3 with narrow pale posterior band (Fig. 59).

Male. Unknown.

Comparison. Differs from other Korean species of the genus by the combination of head weakly rounded and very strongly tapered behind eyes in dorsal view (Fig. 53), flat clypeus (Fig. 52), strongly striate dorsally first metasomal tergite (Fig. 60), and shape of the ovipositor (Fig. 61). This is the only Korean species of the genus *Tersilochus* that possesses an ovipositor with two distinct dorsal subapical teeth (Fig. 61) and thus belongs to the *cognatus* species group (correct name for the *jocator* species group according to Horstmann 2005); *T. iracundus* sp. n. and *T. punctator* sp. n. have ovipositors with rather weak and inconspicuous dorsal subapical teeth (Figs 26, 50, 51).

Type material. Holotype female, South Korea, Gyeongbuk-do (GB), Cheongdo-gun, Gakbuk-myeon, Namsan-3ri, 35°41'N, 128°35'23.0"E, Malaise trap, 1–12. IV.2009, coll. J.W. Lee (YUG).

Distribution. South Korea.

Etymology. Named after the Latin *serratus* (serrated, toothed like a saw), on account of its serrate ovipositor apex.

Tersilochus (*Tersilochus*) *uncinatus* Khalaim & Lee, sp. n.

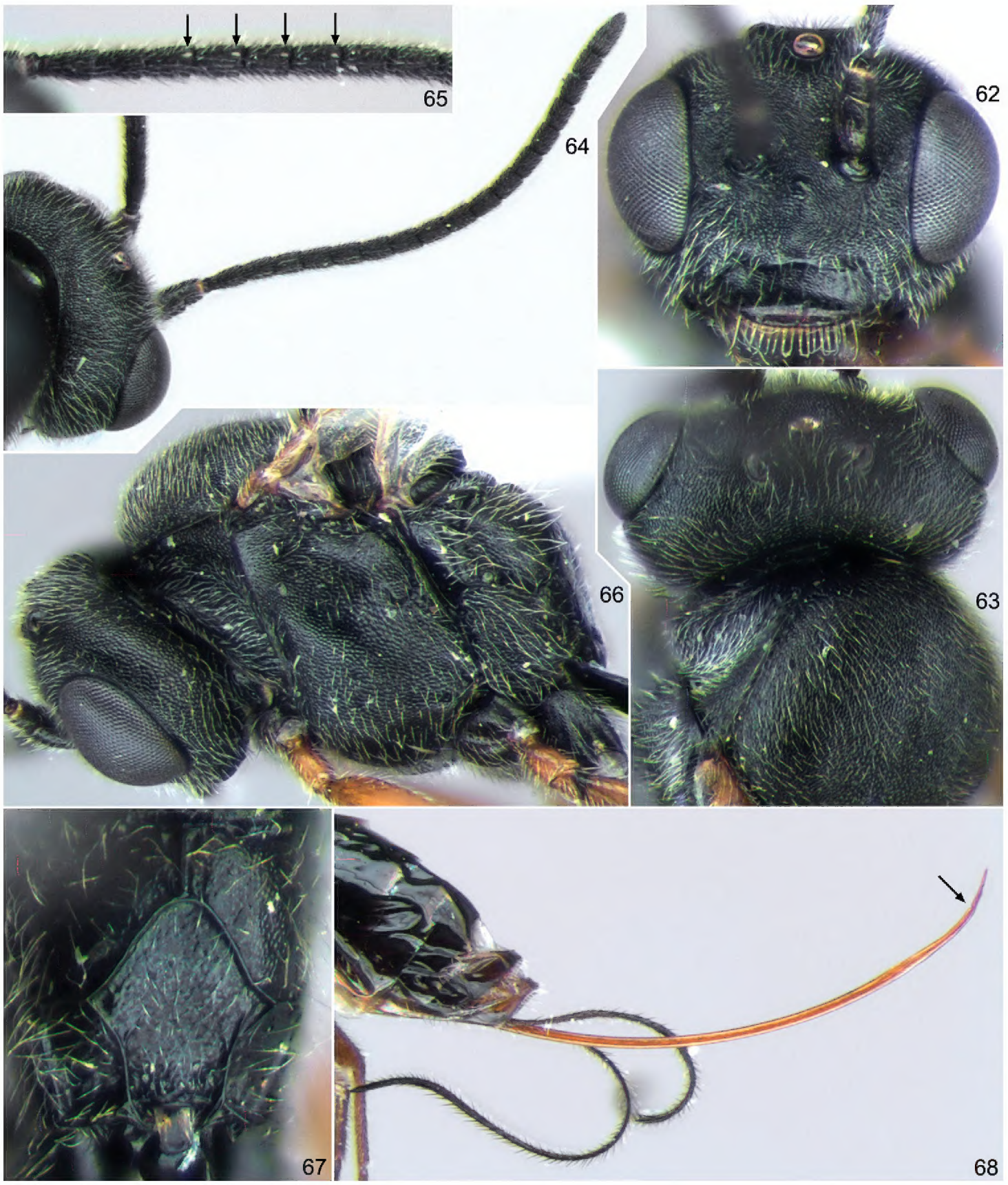
http://zoobank.org/2AF565E7-C651-41DE-9AB1-A0BCF8A9A634

http://species-id.net/wiki/Tersilochus_uncinatus

Figs 62–70

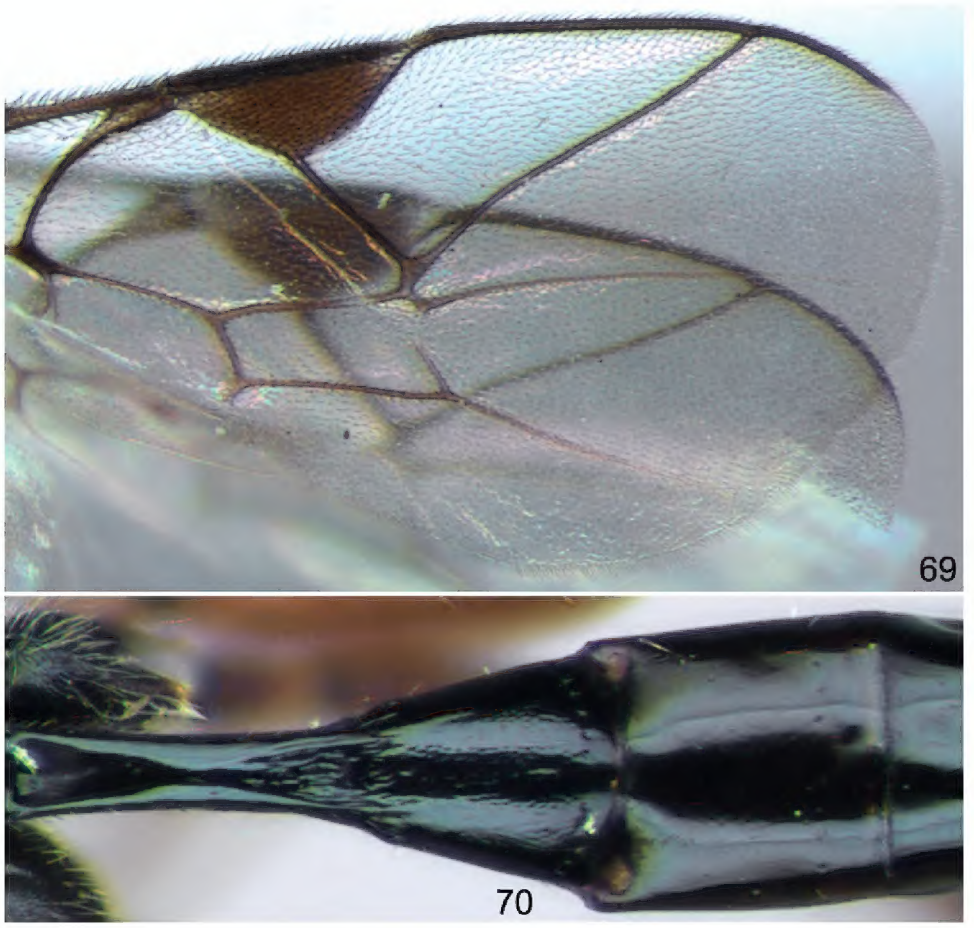
Description. *Female* (holotype). Body length 3.9 mm. Fore wing length 3.05 mm.

Head roundly narrowed behind eyes in dorsal view (Fig. 63); temple almost 0.8 times as long as eye width. Inner eye orbits parallel (Fig. 62). Mandible with upper tooth longer than lower tooth. Clypeus lenticular, 2.75 times as broad as long, with lower 0.3 bent backwards (Fig. 62), in profile weakly convex, finely granulate and with few indistinct punctures in upper 0.7. Malar space almost as long as basal width of mandible. Flagellum of antenna filiform, with 17 segments (Fig. 64); subbasal flagellomeres 1.4–1.5 times and subapical flagellomeres 1.2–1.3 times as long as broad; flagellomeres 3–6 with distinct subapical finger-shaped structures on outer surface (Fig. 65, arrows). Face, frons, vertex, and temple distinctly granulate, dull, and impunctate (Figs 62, 63). Mesosoma entirely granulate, dull, and impunctate; mesopleuron without striae (Fig. 66). Notaulus absent (Fig. 63). Foveate groove absent (Fig. 66). Propodeum with basal keel, which is 0.34 times as long as apical area (Fig. 67). Propodeal spiracle small, separated from pleural carina by half diameter of spiracle (Fig. 66). Apical area flat, anteriorly rounded (Fig. 67). Apical longitudinal carinae well-developed posteriorly and weak anteriorly near transverse carina. Fore wing (Fig. 69) with intercubitus moderately thickened, longer than abscissa of cubitus between intercubitus and second recurrent vein. First abscissa of radius longer than width of pterostigma. Metacarpus not reaching apex of fore wing. Postnervulus intercepted slightly below



Figures 62–68. *Tersilochus uncinatus* sp. n., female, holotype: **62** head, frontal view **63** head and mesoscutum, dorsal view **64** head with antenna, dorso-postero-lateral view **65** base of antenna, lateral view **66** head and mesosoma, lateral view **67** propodeum, dorsal view **68** apex of metasoma with ovipositor, lateral view.

middle. Hind wing with nervellus vertical. Metasoma: first tergite 2.7 times as long as broad posteriorly (Fig. 70), mostly smooth, with petiole trapeziform in cross-section, finely striate laterally before glymma, and postpetiole well separated from petiole in dorsal view. Glymma deep, situated slightly behind center of first tergite, joining by distinct furrow to ventral part of postpetiole. Second tergite as long as anteriorly broad (Fig. 70). Thyridial depression short, distinctly transverse (Fig. 70). Ovipositor slen-



Figures 69–70. *Tersilochus uncinatus* sp. n., female, holotype: **69** fore wing **70** first and second tergites, dorsal view.

der, weakly upcurved in basal 0.8, somewhat thickened subapically, with apex thin, strongly upcurved, and with weak dorsal notch (Fig. 68, arrow); sheath about 3.0 times as long as first tergite.

Head (including clypeus), mesosoma, and first tergite black; palpi brown; mandible fuscous basally and with reddish black teeth; tegula yellow. Antenna entirely black. Pterostigma brown with white spot on distal corner. Legs brown; hind leg with coxa and base of first trochanter strongly darkened with brown. Metasoma behind first tergite brownish black.

Male. Unknown.

Comparison. Differs from other Korean species of the genus *Tersilochus* by the long ovipositor with apex thin and strongly upcurved (Fig. 68).

Type material. Holotype female, South Korea, Gyeongnam-do (GN), Sancheong-gun, Samjang-myeon, Yu Pyeongni, Wangdeungjae, 16.VI–20.IX.2008 (YUG).

Distribution. South Korea.

Etymology. Named after the Latin *uncinatus* (hooked), on account of its apically strongly upcurved ovipositor.

Discussion

All Korean species of *Tersilochus* are rare, being represented in our material by only one or few specimens, whereas in the Russian Far East this genus is conspicuously

much more abundant (Khalaim 2012, pers. data). Almost all specimens were collected in Korea from April to early June, except the paratype of *T. fidicinus* sp. n. (collected in June/July) and the holotype of *T. uncinatus* sp. n. (collected between June and September). Thus, the flight period of the genus in Korea is generally restricted to spring and early summer.

Subapical finger-shaped structures on outer side of subbasal flagellomeres were found and described for all Korean species of *Tersilochus*, and number and location of these structures were used for species separation in the key. Finger-shaped structures on flagellomeres of two European species of *Phradis* Förster were discovered for the first time by Khalaim et al. (2009). Later, these structures were found in many other tersilochine genera, e.g. in Neotropical species of *Allophrys* Förster, *Barycnemis* Förster and *Meggoleus* Townes (Khalaim and Broad 2012), and East Palaearctic species of *Tersilochus* (Khalaim 2012). The finding of finger-shaped structures in Korean species of *Tersilochus* indicates that these structures are widely distributed within the subfamily, and we show that these structures may be used for diagnosing species.

Acknowledgements

We are thankful to Dr M.-L. Sheng for the loan of the additional specimen of *T. punctator*. This work was supported by the Russian Foundation for Basic Research (grant no. 13-04-00026) and the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR No. 2014-02-001, 1834-302).

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